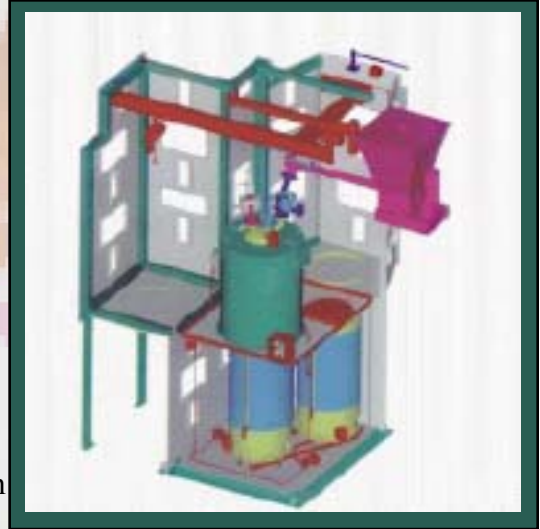


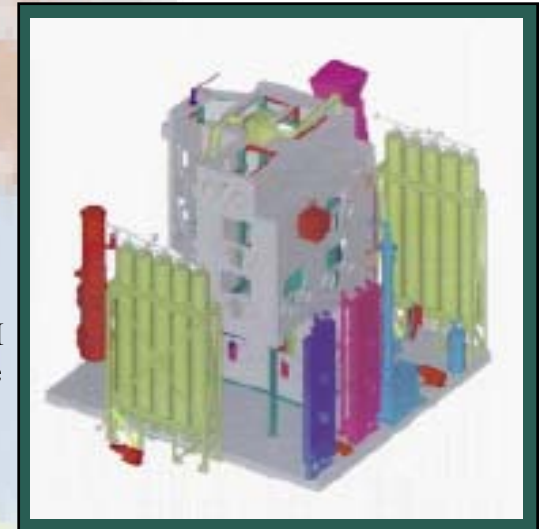
Glovebox Vitrification System

Nuclear Materials Technology Division

A glovebox vitrification system is being fabricated to process aqueous evaporator bottom waste generated at the Plutonium Facility (TA-55) at Los Alamos National Laboratory (LANL). The system will be the first within the U.S. Department of Energy Complex to routinely convert Pu239-contaminated transuranic (TRU) waste to a glass matrix for eventual disposal at the Waste Isolation Pilot Plant (WIPP). Currently at LANL, aqueous evaporator bottom waste (TRU waste) is solidified in cement. Radionuclide loading in the cementation process is restricted by potential radiolytic degradation (expressed as a wattage limit), which has been imposed to prevent the accumulation of flammable concentrations of H₂ within waste packages. Waste matrixes with a higher water content (e.g., cement) are assigned a lower permissible wattage limit to compensate for their potential higher generation of H₂. The glass matrix produced by the vitrification process is nonhydrogenous, no H₂ can be radiolytically evolved, and drums can be loaded to the WIPP Waste Acceptance Criteria maximum allowable limit of 40 watts. In effect, the glass waste form shifts the limiting constraint for loading disposal drums from wattage to the criticality limit of 200 fissile gram equivalents, thus significantly reducing the number of drums generated from this waste stream. The vitrification system will be installed in a new glovebox system, which will be located within the plutonium processing area of TA-55. The glovebox will be located inside a stainless steel-lined room, which is approximately 12 x 14 ft with a 12- to 13-ft ceiling. Approximately 200 L of evaporator bottoms (EVB) will be transferred to two 125-L melter feed tanks. Pre-made glass frit will be delivered in bulk bags and stored outside the facility. A series of augers and hoppers will be used to transfer the frit to the vitrification system. The melter system consists of a resistance-heated unit, an alloy lid, and an Inner Can Movement Mechanism (ICMM). The melt can is made of stainless steel with an outer diameter of 16 in. and a height of 27 in. The ICMM is a mechanism that raises the melt can vertically into the heating zone of the melter, lowers the processed can down into a cooling jacket, and then allows the can to be moved out from under the melter toward the discharge port of the glovebox. The off-gas scrubbing system consists of a quench nozzle, scrub column, and caustic scrub solution recirculation system. A set of interim storage tanks is provided to allow sampling and analysis of the scrub solution before discharge to the radioactive liquid waste treatment facility. Following processing of an EVB batch, the glass will be allowed to cool, placed in the 55-gal. disposal drum, bagged out from the glovebox, and sent to storage.



Cutaway of the Glovebox Vitrification System



View of the Glovebox Vitrification System